

4	<b>REGENERATOR</b>	213	...Mixing within zone of recirculated zone air and supply air adjacent zone air inlet (e.g., induction unit, etc.)
5	.Cleaning		
6	.Movable heat storage mass with enclosure		
7	..With fluid handling system	214	....Including a fan (e.g., fancoil unit, etc.)
8	..Rotary heat collector	215	....Reheat adjacent zone air inlet
9	...Seals	216	....Mixing of separate centrally supplied hot and cold stream before discharge into each zone (e.g., dual-duct, etc.)
9.1	.Checker brick structure		
9.2	..Gradated flow area, heat capacity or heat resistance	217	....Volume flow of discharged air at discharge into zone modulated by zone heating or cooling load (e.g., variable air volume, etc.)
9.3	..Having gas supply or exhaust manifold structure		
9.4	..In casing	218	...Central temperature conditioned liquid supplied to each zone
10	.Heat collector	219	....Separate supply and return mains (e.g., two pipe system, etc.)
11.1	<b>WITH ALARM, INDICATOR, SIGNAL, REGISTER, RECORDER, TEST OR INSPECTION MEANS</b>	220	....Additional supply main (e.g., three pipe system, etc.)
11.2	.Remotely controlled inspection means	221	.....Additional return main (e.g., four pipe system, etc.)
200	<b>WITH TIMER, PROGRAMMER, TIME DELAY, OR CONDITION RESPONSIVE CONTROL</b>	222	..Humidity control
201	.Having heating and cooling capability	223	...Humidity sensor measures humidity of air in conditioned space
202	..Vehicle installation	224	...Additional humidity sensor (e.g., located outside of conditioned space, etc.)
203	...Plural temperature regulators for plural zones	225	...Humidity sensor controls indirect-contact cooling means
204	...Flow control of chest, foot, or defrost air in vehicle	226	....Liquid spray onto indirect-contact cooling means
205	..Plural temperature regulators for plural zones	227	....Air bypass of indirect-contact cooling means
206	...Nonbuilding system (e.g., machine tool, chemical analyzer, etc.)	228	....Reheat of cooled air downstream of indirect-contact cooling means
207	...Refrigeration system having an evaporator or condenser in each zone	229	...Humidity sensor controls humidifier
208	...Central system prioritizes heating and cooling requests from zones	230	...Dewpoint controlled (e.g., control of cooling means by downstream temperature sensor to maintain controlled dewpoint of downstream air, etc.)
209	...Supervisory central control means overrides zone controller		
210	...Heat balancing using waste heat or cold (e.g., heat reclaim, etc.)		
211	...Different conditioning means for perimeter zone and core zone		
212	...Central temperature conditioned air supplied to each zone		

231	..Congealed material (e.g., frost, etc.) or condensation removal or prevention	254	...System selects heating or cooling mode automatically (e.g., responsive to season, ambient light, temperature in conditioned area, etc.)
232	...Operated by timer or programmer	255	...Dead band between heating and cooling
233	...Operated by temperature sensor	256	...Variable rate of heating or cooling (e.g., plural stages, etc.)
234	..Control of static pressure of conditioned space	257	...Room and ambient temperature sensors
235	...Space is within aircraft	258	...Separate heating and cooling thermostats
236	..Control of heat storage	259	...Single temperature sensing means
237	..Means responsive to occupancy of space	260	...Variable rate of heating or cooling (e.g., plural stages, etc.)
238	..Means storing set point for particular time of day (e.g., clock thermostat, etc.)	261	...Sequentially activated heat sources or cool sources
239	...Means to compute time required to reach certain temperature by certain time of day (e.g., morning warm-up, etc.)	262	....Timer
240	..Heat pump and supplemental heat source	263	...Area receives conditioning from simultaneously operated heating and cooling means (e.g., opposed and compensating heating and cooling, etc.)
241	...Change-over from heat pump operation to supplemental heat source operation alone	264	...Simultaneous heating and cooling only in limited range around set point temperature
242	...Responsive to outdoor temperature	265	...Manual changeover between heating and cooling modes (e.g., manual override, etc.)
243	..Means to reset supply air temperature or supply water temperature as function of heat load	266	..Pre-heat or pre-cool of space or device during start-up
244	..Means to control fan or pump to regulate supply air flow or supply water flow	267	..Means to heat or cool for predetermined periods of time (e.g., duty cycle, time-temperature profiler, etc.)
245	...Low flow during heating and high flow during cooling	268	..Predetermined time variable set point
246	...Responsive to pressure	269	..Duty cycle (e.g., pulse duration or pulse frequency modulation, etc.)
247	...Responsive to temperature	270	..Time delay
248	..Flow of air from outdoors controlled (e.g., minimum outside air, etc.)	271	..Vehicle or engine speed responsive
249	...Proportion of outdoor air and return air controlled	272	..Control of heat pipe heat transfer characteristics
250	...Outdoor air used in lieu of operating heating or cooling means (e.g., economy cycle, etc.)	273	..Control of quantity of inert gas
251	....Enthalpy sensor		
252	...Pre-heat or pre-cool of outdoor air before mixing with returned air		
253	..Temperature sensor controlling temperature		

274	..Control of vapor or liquid flow between evaporator and condenser sections (e.g., by variable restrictions, check valves, etc.)	293	...Temperature sensor prior to heat exchanger and one after
275	.Control of amount of conductive gas in confined space between heat source and heat sink	294	...Branched flow of heat exchange material
276	.Control of variable thermal conductivity systems (e.g., heat valves, etc.)	295	..Including mass flow sensor
277	..Solid heat transfer path	296	..Branched flow of heat exchange material
278	.Vent of system (e.g., overpressure, overtemperature, removal of noncondensable, etc.)	297	...Bypass of heat exchanger
279	.Pressure and temperature responsive or control	298	....Mixture temperature sensing
280	..Bypass of heat exchanger responsive to both temperature and pressure	299	..Flow of one heat exchange material controlled by temperature of another
281	.Fluid pressure responsive or control	300	..Flow of one heat exchange material controlled by its own temperature
282	..Branched flow of heat exchange material	301	.Liquid-level responsive or control means
283	...Bypass of heat exchanger	302	..Condenser or evaporator
284	...Differential pressure operated bypass	303	.Cleaning
285	..Flow of one heat exchange material controlled by the pressure of another	41	<b>WITH VEHICLE FEATURE</b>
286	..Flow of one heat exchange material controlled by its own pressure	42	.Heating and cooling
287	.Temperature responsive or control	43	..Vehicle contained common power and heat supply
288	..Plural temperature sensors	44	.Utilizing motion of vehicle
289	...Means to maintain a constant temperature difference between a measured temperature and a controlled temperature	45	<b>GEOGRAPHICAL</b>
290	...Temperature sensor within or near an area to be conditioned, another temperature sensor near the conditioning equipment (e.g., shallow/deep, etc.)	46	<b>FLEXIBLE ENVELOPE OR COVER TYPE</b>
291	...Temperature sensor inside conditioned space, another temperature sensor outdoor (e.g., indoor set point adjusted by outdoor conditions, etc.)	47	<b>STRUCTURAL INSTALLATION</b>
292	...Temperature sensor in treated fluid, another temperature sensor in treating fluid	48.1	.Heating and cooling
		48.2	..Solar
		49	..Radiant building panel
		50	..Room heat exchangers with central fluid supply
		51	.Engine
		52	..Exchange between engine supply and exhaust lines
		53	..Related to wall, floor or ceiling structure of a chamber
		54	..In a chamber connected passage traversing the structure
		55	..Projecting shield forms passage with the structure
		56	..Hollow or recess in the structure connected for exchange fluid flow
		57	...Ported to the chamber
		58	<b>HEATING AND COOLING</b>
		59	.With ventilation
		60	.Gas-liquid contactor
		61	.Heating and cooling of the same material
		62	..Refrigerating system conversion
		63	..Refrigeration producer
		64	..Heat generator
		65	..Heater and cooler serially arranged

- 66 ...Heat exchange between supply and exhaust lines
- 67 **WITH EXTERNAL SUPPORT**
- 68 .Legs
- 69 **RESILIENT VIBRATION DAMPER**
- 70 **ISOLATING EXCHANGER ELEMENT**
- 71 **WITH LEAKAGE COLLECTOR**
- 72 **WITH PURGE, OR DRAINAGE, COCK OR PLUG**
- 73 **COVERED ACCESS OPENING**
- 74 .Cover is, or carries, heat exchanging means
- 75 ..Heat exchanging means projects into the covered chamber
- 76 ..Heating or cooling means within the covered chamber
- 77 **WITH REPAIR OR ASSEMBLY MEANS**
- 78 .Hinge
- 79 .Guide
- 80 .Positioner or retainer for settable material
- 80.1 **WITH RETAINER FOR REMOVABLE ARTICLE**
- 80.2 .Electrical component
- 80.3 ..Air cooled, including fins
- 80.4 ..Liquid cooled
- 80.5 .Including liquid heat exchange medium
- 81 **EXPANSION AND CONTRACTION**
- 82 **RELIEVING OR ABSORBING MEANS**
- 83 .Relieving or absorbing means supports temperature modifier in heat exchanger
- 84 ..Flexible fluid confining wall
- 85 **WITH MEANS FLEXING, JARRING OR VIBRATING HEAT EXCHANGE SURFACE**
- 86 **AGITATOR OR IMPELLER MOTOR OPERATED BY EXCHANGE FLUID**
- 87 **MOVABLE HEATING OR COOLING SURFACE**
- 88 .Hollow screw type impeller
- 89 .Rotor carrying separate chambers for two exchanging fluents
- 90 .Rotary drum
- 91 ..With means applying fluids for exchange through drum wall
- 92 ...With drum surface scraper
- 93 .Hollow stirrer or scraper
- 94 ..Material advancer in shelf to shelf device
- 95 **WITH SCRAPER REMOVING PRODUCT FROM TEMPERATURE MODIFYING SURFACE**
- 96 **WITH CLEANING MEANS FOR HEAT EXCHANGER**
- 97 **WITH ADJUSTOR FOR HEAT, OR EXCHANGE MATERIAL, FLOW**
- 98 .Flow reversed or crossed within temperature modifying zone
- 99 .Adjustable radiator face covering means
- 100 ..Discharge grille or diffuser
- 101 .Branched flow
- 102 ..Controls flow through parallel heating or cooling means
- 103 ..Tortuous and straight through branches within heating or cooling drum
- 104 .By pass of heating or cooling means
- 104.11 **INTERMEDIATE FLUENT HEAT EXCHANGE MATERIAL RECEIVING AND DISCHARGING HEAT**
- 104.12 .Reversible chemical reaction
- 104.13 .Plural intermediate fluent heat exchange materials
- 104.14 ..Always out of direct contact with each other
- 104.15 .Solid fluent heat exchange material
- 104.16 ..Fluidized bed
- 104.17 ..Utilizing change of state
- 104.18 ..Including means to move heat exchange material
- 104.19 .Liquid fluent heat exchange material
- 104.21 ..Utilizing change of state
- 104.22 ...Including means to move heat exchange material in liquid state
- 104.23 ....By direct application of electrical energy to heat exchange material
- 104.24 ....By application of heat other than in heat receiving area
- 104.25 ....By application of mechanical energy
- 104.26 ...Utilizing capillary attraction
- 104.27 ...With pressurizing means or degassifying means
- 104.28 ..Including means to move heat exchange material
- 104.29 ...Utilizing formed bubble
- 104.31 ...By application of mechanical energy
- 104.32 ..With pressurizing means or degassifying means
- 104.33 ..Cooling electrical device

104.34	.Including means to move gaseous heat exchange material	139	<b>INTERNALLY BRANCHED FLOW, EXTERNALLY PORTED</b>
108	<b>RECIRCULATION</b>	140	<b>THREE NON-COMMUNICATING FLUIDS</b>
109.1	<b>WITH AGITATING OR STIRRING STRUCTURE</b>	141	.Concentric flow chambers
110	<b>WITH FIRST FLUID HOLDER OR COLLECTOR OPEN TO SECOND FLUID</b>	142	<b>SPUR TUBE PROJECTS INTO ENCLOSURE</b>
111	.Separate external discharge port for each fluid	143	<b>PLURAL CASTING-CONDUIT UNITS&lt;&lt; LINE OR COMMON HEADER CONNECTED</b>
112	..With downstream pressure or temperature modifier	144	<b>LINE CONNECTED CONDUIT ASSEMBLIES</b>
113	...Surface-type heat exchanger	145	.In common casing
114	..With baffle at inlet to less dense fluid discharge port	146	<b>GRADATED HEAT TRANSFER STRUCTURE</b>
115	.Trickler	147	.Tapered conduit means
116	..Shelf to shelf	148	<b>RADIATOR CORE TYPE</b>
117	..Pipe exterior to pipe exterior	149	.With edge cover or frame means
118	..Vertical cone or drum	150	.Serially connected tube sections
119	<b>WITH SOLIDS SEPARATOR FOR EXCHANGE FLUID</b>	151	.Side-by-side tubes traversing fin means
120	<b>WITH IMPELLER OR CONVEYOR MOVING EXCHANGE MATERIAL</b>	152	.Deformed sheet forms passages between side-by-side tube means
121	.Mechanical gas pump	153	..With tube manifold
122	..Heating or cooling means and gas pump in housing	154	<b>NON-COMMUNICATING COAXIAL ENCLOSURES</b>
123	...With injector-type gas pump	155	.With communicating coaxial enclosure
124	...Verging gas flow	156	.Helical conduit means
125	....Radial flow through annular heating or cooling means	157	<b>CASING OR TANK ENCLOSED CONDUIT ASSEMBLY</b>
126	....Single inlet, plural outlets	158	.Manifold formed by casing section and tube sheet of assembly
127	.....Gas pump for each outlet stream	159	.With distinct flow director in casing
128	<b>THERMOSYPHONIC FLUE TYPE</b>	160	..Longitudinal
129	.Heating or cooling means within distinct flue forming enclosure	161	...Additional transverse baffle
130	.Flue formed between facing second fluid containing conduits	162	.With support in casing
131	.Flues formed by vertical corrugations of heat transmitter	163	.Conduit coiled within casing
132	<b>HEATING OR COOLING MEANS IN OPEN COMMUNICATION WITH RESERVOIR</b>	164	<b>FLOW PASSAGES FOR TWO CONFINED FLUIDS</b>
133	<b>WITH COATED, ROUGHENED OR POLISHED SURFACE</b>	165	.Interdigitated plural first and plural second fluid passages
134.1	<b>WITH PROTECTOR OR PROTECTIVE AGENT</b>	166	..Stacked plates or shells form interplate passages
135	<b>WITH THERMAL OR ACOUSTICAL BLOCKER</b>	167	...With plate traversing passages interconnecting alternate spaces
136	.Insulation and temperature modifier within barrier member	168	<b>CONDUIT WITHIN, OR CONFORMING TO, PANEL OR WALL STRUCTURE</b>
137	<b>CONVERTIBLE</b>	169	.Wall forms enclosure
138	<b>COMBINED</b>	170	.Opposed plates or shells
		171	.Means spanning side-by-side tube elements
		172	<b>SIDE-BY-SIDE TUBULAR STRUCTURES OR TUBE SECTIONS</b>

173 .With manifold type header or  
header plate  
174 ..With internal flow director  
175 ..Inlet and outlet header means  
176 ...Side by side  
177 **TUBULAR STRUCTURE**  
178 .With support or flow connector  
179 .Projecting internal and external  
heat transfer means  
180 .Diverse materials  
181 .With discrete heat transfer  
means  
182 ..With means spacing fins on  
structure  
183 ..Longitudinal extending  
184 ...Helical  
185 **HEAT TRANSMITTER**  
186 **MISCELLANEOUS**

**CROSS-REFERENCE ART COLLECTIONS**

900 **COOLING TOWERS**  
901 **HEAT SAVERS**  
902 **HEAT STORAGE**  
903 **CONVECTION**  
904 **RADIATION**  
905 **MATERIALS OF MANUFACTURE**  
906 **REINFORCEMENT**  
907 **POROUS**  
908 **FLUID JETS**  
909 **REGENERATION**  
910 **TUBE PATTERN**  
911 **VAPORIZATION**  
912 **COMBINED OR CONVERTIBLE HEAT  
EXCHANGE MODES**  
913 **CONDENSATION**  
914 **FILMING**  
915 **FOAMING**  
916 **OIL COOLER**  
917 **PRESSURIZATION AND/OR  
DEGASSIFICATION**  
918 **HEATED AND COOLED FOOD CABINETS  
AND/OR TRAYS**  
919 .Wheeled  
920 **PARTICULATE HEAT EXCHANGE**  
921 **DEW POINT**

**FOREIGN ART COLLECTIONS**

FOR **CLASS-RELATED FOREIGN DOCUMENTS**

FOR 100 **PROCESS (165/1)**  
FOR 101 .Heating and cooling (165/2)  
FOR 102 ..Humidity adjusting (165/3)  
FOR 103 **TIME OR PROGRAM ACTUATOR (165/12)**  
FOR 104 **AUTOMATIC CONTROL (165/13)**  
FOR 105 .Heating and cooling (165/14)  
FOR 106 ..With cabin pressure control  
(165/15)  
FOR 107 ..With ventilation control (165/  
16)  
FOR 108 ..Defrosting (165/17)  
FOR 109 ..With control of heat storage  
(165/18)  
FOR 110 ..With gas and liquid contact  
fluid flow control (165/19)  
FOR 111 ...By humidity sensor (165/20)  
FOR 112 ..With humidity sensor  
controlling humidity (165/21)  
FOR 113 ..Correlation of plural zone  
controls and central system  
control (165/22)  
FOR 114 ..Responsive to vehicle body  
motion (165/23)  
FOR 115 ..With manual control (165/24)  
FOR 116 ...Manual selector modifies  
automatic control (165/25)  
FOR 117 ..Single sensor controls both  
heating and cooling (165/26)  
FOR 118 ..Selective heating or cooling  
(165/27)  
FOR 119 ...Room and ambient temperature  
sensors (165/28)  
FOR 120 ..Heat pump with supplemental  
heat (165/29)  
FOR 121 ..Opposed compensating heating  
and cooling (165/30)  
FOR 122 ..Pressure response or control  
(165/31)  
FOR 123 .Temperature or pressure (165/32)  
FOR 124 ..With correlated manual  
actuation (165/33)  
FOR 125 ..Branched flow of exchanging  
fluid (165/34)  
FOR 126 ...By-pass of heat exchanger  
(165/35)  
FOR 127 ....Mixture temperature sensing  
(165/36)  
FOR 128 ....With pressure response (165/  
37)  
FOR 129 ....Pressure controlled (165/38)  
FOR 130 ..Flow of one heat exchanging  
material controlled by the  
condition of another (165/37)

FOR 131 ..Flow of heat exchanging material controlled by its own condition (165/40)

# DIGESTS

DIG 1 **WITH ALARM, INDICATOR, RECORDER, TEST, OR INSPECTION MEANS**

DIG 2 ..Energy, efficiency, performance or malfunction

DIG 3 ..Remote control inspection means

DIG 4 ..Sight glass

DIG 5 ..Fluid level or amount

DIG 6 ..Temperature

DIG 7 ..Flow or valve position

DIG 8 ..Leakage

DIG 9 **HAVING A SOLID HEAT STORAGE MASS FOR ABSORBING HEAT FROM ONE FLUID AND RELEASING IT TO ANOTHER (I.E. REGENERATOR)**

DIG 10 ..Cleaning storage mass

DIG 11 ..Reciprocating cleaner device (e.g. scraper, sprayer)

DIG 12 ..Spray nozzle cleaner

DIG 13 ..Movable heat storage mass with enclosure

DIG 14 ..Reciprocated linearly

DIG 15 ..With pump

DIG 16 ..Rotary storage mass

DIG 17 ...With thermal expansion compensating means

DIG 18 ...Having means controlling direction or rate of flow

DIG 19 ....Plate type shutter associated with face of storage mass

DIG 20 ...Seal and seal-engaging surface are relatively movable

DIG 21 ....Seal engaging a face of cylindrical heat storage mass

DIG 22 .....Seal defining sector-shaped flow area

DIG 23 .....Brush-type seal

DIG 24 ....Circumferential seal

DIG 25 ....Heat resistant material seal

DIG 26 ...Seal attached to and rotating with storage mass

DIG 27 ...With particular rotary bearing or drive means

DIG 28 ...Ring gear surrounding cylindrical storage mass

DIG 29 ...Cylindrical storage mass with axial flow passages

DIG 30 ..Mass formed of modules arranged in three dimensional matrix ("Checkerwork")

DIG 31 ..Gradated flow area, heat capacity or conductivity

DIG 32 ..Having gas supply or exhaust manifold structure

DIG 33 ...With flow control device (i.e. valve)

DIG 34 ...With flow distributing baffle

DIG 35 ..In casing

DIG 36 ..Distinct passages formed in individual modules

DIG 37 ..Having flow diverting means (e.g. valve) to selectively control flow through storage mass

DIG 38 ..Correlated control of plural diverting means

DIG 39 ...Synchronously rotated flow guiding hoods disposed on opposite sides of fixed regenerator

DIG 40 ...Linearly movable diverting means

DIG 41 ..Rotary diverting means

DIG 42 ..Particular structure of heat storage mass

DIG 43 ..Element for constructing regenerator rotor

DIG 44 **HAVING FLEXIBLE HEAT EXCHANGE SURFACE CONFORMING TO A SOLID STRUCTURE (E.G., APPLICATOR, ETC.)**

DIG 45 ..Conform to head, neck, or face

DIG 46 ..Heat exchange body suit

DIG 47 ..For cooling

DIG 48 ..Electrical component

DIG 49 ..Or for heating

DIG 50 ...Including a pump or valve

DIG 51 **HAVING EXPANSION AND CONTRACTION RELIEVING OR ABSORBING MEANS**

DIG 52 ..For cylindrical heat exchanger

DIG 53 ..Flexible or movable header or header element

DIG 54 ...Movable header (e.g., floating header, etc.)

DIG 55 ....Including guiding means for movable header

DIG 56 .....Fluid sealing means between movable header and enclosure

DIG 57 ...Flexing tubesheet

DIG 58 ...Movable tubesheet (e.g., floating tubesheet, etc.)

- DIG 59 ....Tubesheet connected to enclosure by expansion joint
- DIG 60 ..Expandable casing for cylindrical heat exchanger
- DIG 61 ...For plural cylindrical heat exchangers
- DIG 62 ...Having particular external casing support means
- DIG 63 ..Cylindrical heat exchanger fixed to fixed end supports
- DIG 64 ...Including intermediate support
- DIG 65 ...Bent cylindrical heat exchanger
- DIG 66 ....Coiled
- DIG 67 ..Cylindrical heat exchanger rectilinearly slidable relative to its support
- DIG 68 ...Including fluid seal
- DIG 69 ..Pivotal support for cylindrical heat exchanger
- DIG 70 ..Resilient fluid seal
- DIG 71 ..Resilient fluid seal for plate-type heat exchanger
- DIG 72 **AGITATOR OR IMPELLER MOTOR OPERATED BY FIRST HEAT EXCHANGE FLUID**
- DIG 73 ..To agitate or move second heat exchange fluid
- DIG 74 ..Agitator structure confines first heat exchange fluid
- DIG 75 ..Agitator structure confines second heat exchange fluid
- DIG 76 **WITH SCRAPER FOR REMOVING PRODUCT FROM HEAT TRANSFER SURFACE**
- DIG 77 ..Screw shaped scraper
- DIG 78 ..Linearly operated scraper
- DIG 79 ..Reciprocated linearly
- DIG 80 ..Plural scrapers for spaced shelves or chambers
- DIG 81 ..Rotary heat exchange scraper or scraper for rotary heat exchange surface
- DIG 82 ..Grooved drum surface
- DIG 83 ..Scraper attached to or formed part of rotary heat exchange fluid surface
- DIG 84 ..Scraper within annular space formed by concentric cylinders or concentric conical surfaces
- DIG 85 ..Scraper for cleaning inner surface of rotary heat exchange surface
- DIG 86 ..Weight operated scraper
- DIG 87 ..Spring pressed scraper
- DIG 88 ..Adjustable scraper
- DIG 89 ..For scraping flat horizontal surface
- DIG 90 ..Scraper blade movable relative to scraper blade support (e.g., pivoting blade, rocking blade, etc.)
- DIG 91 ..For scraping wall of cylindrical heat exchanger
- DIG 92 **WITH VALVE OR MOVABLE DEFLECTOR FOR HEAT EXCHANGE FLUID FLOW**
- DIG 93 ..Adjustable radiator face covering means (e.g., adjustable shield for car radiator, heater core, etc.)
- DIG 94 ..Windowshade type (i.e. sheet feeds off roller)
- DIG 95 ..Rectilinear sliding movement of adjustable cover
- DIG 96 ..Pivotal movement of adjustable cover
- DIG 97 ...Plural parallel pivotable shutters
- DIG 98 ....One shutter section having different flow area or flow direction with another shutter section
- DIG 99 ....With fan
- DIG 100 ..Flow direction reversed through heat exchanger
- DIG 101 ..For controlling supply of heat exchange fluid flowing between hydraulically independent heat exchange sections
- DIG 102 ..Hydraulically independent single-confined-fluid radiator sections for heating ambient air
- DIG 103 ...Valves each controls a radiator section
- DIG 104 ..Hydraulically independent heat exchange sections connected in parallel
- DIG 105 ...Correlated valves
- DIG 106 ...Valves each controls a heat exchange section
- DIG 107 ....Hydraulically independent heat exchange tubes disposed in housing (e.g., tank, casing, etc.)
- DIG 108 ....Coiled tubes
- DIG 109 ..With by-pass of heat exchanger or heat exchanger section
- DIG 110 ..Bypass within or surrounds heat exchanger



- DIG 111 ...Heat exchanger enclosing a fluid conduit confining second heat exchange fluid
- DIG 112 ....Stove pipe drum having air draft passage for heating ambient air
- DIG 113 ...Bypass centrally located in heat exchanger
- DIG 114 ....Having perforated wall
- DIG 115 ....Surrounding by a helical flow channel
- DIG 116 ....Plural adjacent flow channel parallel to central bypass
- DIG 117 ....Arranged for series flow therethrough
- DIG 118 ...Serpentine heat exchange flow path
- DIG 119 ...Bypass controlled by pivotal damper
- DIG 120 ..U or serpentine heat exchange flow path
- DIG 121 ...Serpentine heat exchange flow path
- DIG 122 ..U heat exchange flow path and linear bypass
- DIG 123 .Heat exchange flow path through heat exchanger altered (e.g., crossed, etc.)
- DIG 124 ..Stove pipe drum
- DIG 125 ...Valve mounted on fixed deflector
- DIG 126 .Total flow rate through heat exchanger controlled by valve
- DIG 127 ..Stove pipe drum
- DIG 128 ...Including air draft passage for heating ambient air
- DIG 129 ..Valve regulates flow through housing enclosing heat exchanger
- DIG 130 ...Including valve regulating flow through heat exchanger
- DIG 131 ..Single-confined-fluid radiator for heating ambient air
- DIG 132 **WITH ADJUSTOR FOR HEAT FLOW**
- DIG 133 .Conduction rate
- DIG 134 ..By varying thickness of conductive layer (e.g., air gap, etc.)
- DIG 135 **MOVABLE HEAT EXCHANGER**
- DIG 136 .Movable belt or strip transfers heat to or from objects or material thereon
- DIG 137 .Unconstrained movement (e.g., float, etc.)
- DIG 138 .Partially rotatable (e.g., rocking, pivoting, oscillation, tilting, etc.)
- DIG 139 .Fully rotatable
- DIG 140 ..Rotating heat exchanger having rotating flow confining structures or chambers for two separate heat exchange fluids
- DIG 141 ...Concentric flow confining structures or chambers
- DIG 142 ....Jacketed shell
- DIG 143 ...Discrete tubing having length extending along a longitudinal axis of rotating heat exchanger
- DIG 144 ....Helical
- DIG 145 ..Radially extending hollow arm on rotating shaft traverses furnace shelf (e.g., rabble arm, etc.)
- DIG 146 ...Angled blade suspended from arm for advancing material
- DIG 147 ..Fluid impeller or material advancer
- DIG 148 ...Auger
- DIG 149 ....Having hollow blade
- DIG 150 ...Radial or axial impeller
- DIG 151 ....Having hollow blade
- DIG 152 ..Rotating agitator
- DIG 153 ...Flow space or fluid chamber defined between two relatively movable, closely spaced coextensive surfaces
- DIG 154 ...Hollow tubing rotates in vessel to stir contents
- DIG 155 ....Tubing has radially or axially extending sections
- DIG 156 ..Hollow cylindrical member (e.g., drum, etc.)
- DIG 157 ...Fluid sprayed onto surface of rotatable cylinder
- DIG 158 ...Having stationary material removal means
- DIG 159 ...With particular flow path or defined fluid chamber (e.g., annulus, spiral, etc.)
- DIG 160 ....Concentric shells define annular flow space
- DIG 161 ....With means defining particular flow path (e.g., baffle, etc.)
- DIG 162 **ONLY DIRECT-CONTACT HEAT EXCHANGE BETWEEN TWO SEPARATELY SUPPLIED FLUIDS**

- DIG 163 **INCLUDING A MEANS TO FORM FLUID FILM ON HEAT TRANSFER SURFACE (E.G., TRICKLE)**
- DIG 164 .Film flow constrained to spiral path
- DIG 165 .Film formed on spirally coiled member
- DIG 166 .Vertically spaced pipe sections contact liquid in underlying troughs
- DIG 167 .Liquid film flows sequentially along upper surfaces of vertically spaced trays (i.e. shelf-to-shelf)
- DIG 168 .Film formed on interior surface of container or pipe
- DIG 169 ..Inside of vertical pipe
- DIG 170 ...Distributor "cap" mounted in top end of pipe
- DIG 171 .Including means at top end of vertical pipe to distribute liquid film on pipe exterior
- DIG 172 .Film flows along exterior of plural pipe sections
- DIG 173 ..Pipe exterior surfaces about to form continuous surface
- DIG 174 ..Intervening members extend between spaced pipe sections to form continuous surface
- DIG 175 ..Horizontally extending, parallel sections disposed in vertical array (i.e. one pipe directly above another)
- DIG 176 ..With means suspended beneath pipe surface to guide liquid droplets
- DIG 177 .Film flows along upper surface of tray
- DIG 178 ..Parallel corrugated vertical sheets formed fluid passage therebetween
- DIG 179 ..Container enclosed by casing
- DIG 180 ..Vertically disposable elongated member
- DIG 181 ..Horizontally disposable elongated member
- DIG 182 **INDIRECT-CONTACT COOLING TOWER**
- DIG 183 **INDIRECT-CONTACT EVAPORATOR**
- DIG 184 **INDIRECT-CONTACT CONDENSER**
- DIG 185 .Having stacked plates forming flow channel therebetween
- DIG 186 ..Stacked plates surrounded by housing confining another fluid
- DIG 187 .Having pump downstream of condenser
- DIG 188 ..Pump to remove only uncondensed vapor or air
- DIG 189 ...From a first-stage direct-contact condenser
- DIG 190 ...Including second-stage indirect-contact condenser
- DIG 191 ...Including second-stage direct-contact condenser
- DIG 192 .Including means to heat collected condensate
- DIG 193 .First-stage condenser serially connected to second-stage condenser
- DIG 194 ..First stage direct-contact condenser
- DIG 195 .Including condensate collecting tray connected to condensate drain conduit to divert condensate around a section of heat transfer surface
- DIG 196 .Baffle defines flow passage within header for condensate to bypass portion of vapor flow path
- DIG 197 .Including means for (removing) condensate (from vapor flow path) to bypass portion of vapor flow path
- DIG 198 .Condensate guiding means attached to heat transfer surface
- DIG 199 ..Heat transfer tube surrounds by jacket condensate guiding means
- DIG 200 ..Condensate guiding means forms inside heat transfer tube
- DIG 201 ..Including fin member associated with condensate guiding means
- DIG 202 .Vapor flow passage between vapor inlet and outlet has decreasing cross-sectional area
- DIG 203 ..Coolant tubes arranged in groups to form vapor flow lanes of decreasing cross-sectional area
- DIG 204 .Including a direct-contact heat exchange chamber
- DIG 205 .Space for condensable vapor surrounds space for coolant
- DIG 206 ..Including coiled heat exchange tube

- DIG 207 ..Distinct outlets for separated condensate and gas
- DIG 208 ...Including vapor guide plate extending across vapor inlet
- DIG 209 ...Including tube banks arranged in undulating pattern (e.g., w shape)
- DIG 210 ...Including perforated baffle completely surrounding a group of coolant tube
- DIG 211 ...Including concave member adjacent to vapor outlet and partially covering a group of coolant tubes
- DIG 212 ...Including inclined flat condensate guiding means
- DIG 213 ...Including baffle partially covering a group of coolant tubes
- DIG 214 ...Including baffle structure for reversing flow direction of vapor
- DIG 215 ..Having longitudinal partition extending parallel to longitudinal axis of coolant tube
- DIG 216 ..Having partition transverse to longitudinal axis of coolant tube
- DIG 217 .Space for coolant surrounds space for vapor
- DIG 218 ..Condensor adapted to cover opening at top of vapor generator
- DIG 219 ...Radiator cap condenser
- DIG 220 ..U-shaped or spur tubes connected to adjacent inlet and outlet headers
- DIG 221 ..Vapor is the only confined fluid
- DIG 222 ...Plural parallel tubes confining vapor connecting between spaced headers
- DIG 223 ..Vapor tube enclosed by coolant confining shell
- DIG 224 **INCLUDING A MEANS TO FORM A FLUID JET**
- DIG 225 **WITH SOLID CONVEYOR**
- DIG 226 .Screw conveyor
- DIG 227 .Belt conveyor
- DIG 228 **WITH FAN OR PUMP**
- DIG 229 .Screw conveyor in pipe or tank
- DIG 300 .Injector-type pump
- DIG 301 ..Having nested nozzles
- DIG 302 .Rotary gas pump
- DIG 303 ..Annular heat exchanger
- DIG 304 ...Axial impeller
- DIG 305 ....Located at heat-exchange housing inlet
- DIG 306 ....Located at heat-exchange housing outlet
- DIG 307 ..Including plural impellers
- DIG 308 ...Coaxial impellers
- DIG 309 ....Radial impeller
- DIG 310 ..Heat exchanger located at housing inlet or outlet
- DIG 311 ..Including particular flow deflector (e.g., shroud, diffuser, etc.)
- DIG 312 ...Plural parallel deflectors
- DIG 313 ...Deflector with curved surface
- DIG 314 ..Radial impeller
- DIG 315 ...Located at heat-exchange housing inlet
- DIG 316 ..Axial impeller located at heat-exchange housing inlet
- DIG 317 ..Axial impeller located at heat-exchange housing outlet
- DIG 318 **WITH DRIVEN AGITATOR**
- DIG 319 .Linearly moving agitator
- DIG 320 .Fully rotary agitator
- DIG 321 ..Generating toroidal flow
- DIG 322 ..Including heat exchange jacket-walls
- DIG 323 ...Heating or cooling coil disposed between jacket-walls
- DIG 324 ...Agitator having blade sections mounted along rotating shaft
- DIG 325 ..Blade sections mounted along rotating shaft
- DIG 326 ..Agitator and heating or cooling coil disposed in same housing
- DIG 327 **THERMOSYPHONIC HAVING VERTICAL AIR DRAFT PASSAGE**
- DIG 328 .Air draft passage confined entirely or in part by fin structure
- DIG 329 ..Corrugated fin attached to heat transfer surface
- DIG 330 ..Air draft passage is parallel to flow direction of heating or cooling means
- DIG 331 .Air draft passage confined entirely by heat transfer surface
- DIG 332 ..Coaxial ducts define air draft passage and annular passage for heat exchange fluid
- DIG 333 ...Including baffle

- DIG 334 ....Baffle located in annular passage
- DIG 335 ..Plural air draft passages enclosed by casing
- DIG 336 ...Angled air draft passage
- DIG 337 .Heating or cooling means entirely surrounded by air draft passage forming casing
- DIG 338 ..Nested or concentric members define annular air draft passage and heating or cooling conduit
- DIG 339 ...With baffle
- DIG 340 ..Including flow baffle in casing
- DIG 341 ..Parallel heating or cooling tubes or tubular sections (e.g., coil, serpentine, etc.)
- DIG 342 **TANK WITH HEAT EXCHANGER**
- DIG 343 .Heat exchanger forms all or portion of tank
- DIG 344 ..Spiral coil forms hemispherical vessel
- DIG 345 ..Jacketed vessel
- DIG 346 ...Flow baffle or fin in annular flow space
- DIG 347 .Heat exchanger forms cover for tank
- DIG 348 .Heat exchanger within tank
- DIG 349 ..Supported by cover for tank
- DIG 350 ..Tubing removably coupled to inlet and outlet at tank wall
- DIG 351 ..Spaced from tank wall
- DIG 352 ..Flow directing baffle associated with heat exchanger tubing
- DIG 353 .Tube coil bonded directly to tank exterior
- DIG 354 .Heat exchanger serially connected to tank
- DIG 355 **HAVING SEPARATE FLOW PASSAGE FOR TWO DISTINCT FLUIDS**
- DIG 356 .Plural plates forming a stack providing flow passages therein
- DIG 357 ..Forming annular heat exchanger
- DIG 358 ...Radially arranged plates
- DIG 359 ..Including means for modifying thermal stress in heat exchange plate
- DIG 360 ..Stacked plates having plurality of perforations
- DIG 361 ..Circular flow passages between plates
- DIG 362 ..Heat exchange liquids separated by double walls
- DIG 363 ..Slotted plates forming grid
- DIG 364 ...With fluid traversing passages formed through the plate
- DIG 365 ...Including peripheral seal element forming flow channel bounded by seal and heat exchange plates
- DIG 366 ....Rigid or semi-rigid peripheral seal frame
- DIG 367 ....Peripheral seal element between corrugated heat exchange plates
- DIG 368 ....Including angled corrugations with respect to flow direction
- DIG 369 ....Including seal to plate attachment means
- DIG 370 ...Unitary heat exchange plate and projecting edge
- DIG 371 ...Including mating flanges around fluid traversing passage
- DIG 372 ...Adjacent heat exchange plates having joined bent edge flanges for forming flow channels therebetween
- DIG 373 ..Adjacent heat exchange plates having joined bent edge flanges for forming flow channels therebetween
- DIG 374 ...Liquid to air heat exchanger having liquid passage formed by joined sheets
- DIG 375 ....Transverse air tubes
- DIG 376 ....Air passages defined by spacing projections of sheets
- DIG 377 ....Spacing projections formed by folded sheet portions
- DIG 378 ....Including intermediate sheet supporting opposed spacing projections
- DIG 379 ...Including corrugated air fin passages between adjacent liquid passages
- DIG 380 ....Air fin conforms to joined corrugated sheets forming plural liquid chambers
- DIG 381 ....Including air fin apertures
- DIG 382 ...Overlapping flanges
- DIG 383 ...Interlocking flanges
- DIG 384 ...Thermally bonded side edges
- DIG 385 ..Bent sheet forming a single tube
- DIG 386 ...To form only air passages

- DIG 387 ...Including side-edge seal or edge spacer bar
- DIG 388 ...Including spacer bar transverse to plate stack
- DIG 389 ...Flow enhancer integral with side-edge seal or edge spacer bar
- DIG 390 ...Flange element to connect two adjacent heat exchange plates
- DIG 391 ...Including intermediate corrugated element
- DIG 392 ...Unitary heat exchange plate and projecting edge
- DIG 393 ...Including additional element between heat exchange plates
- DIG 394 ...Corrugated heat exchange plate
- DIG 395 ...Monolithic core having flow passages for two different fluids (e.g., one-piece ceramic, etc.)
- DIG 396 ...Plurality of stacked monolithic cores
- DIG 397 ...Including conduits embedded in monolithic block
- DIG 398 ...Spirally bent heat exchange plate
- DIG 399 ...Corrugated heat exchange plate
- DIG 400 ...Shell enclosed conduit assembly
- DIG 401 ...Including tube support or shell-side flow director
- DIG 402 ...Manifold for shell-side fluid
- DIG 403 ...Preheater for shell-side fluid for preventing thermal shock to tube sheet
- DIG 404 ...Serially connected separate shells
- DIG 405 ...Extending in a longitudinal direction
- DIG 406 ....Helically or spirally shaped
- DIG 407 ....Internal casing or tube sleeve
- DIG 408 .....Tube sleeve
- DIG 409 .....Including transverse element (e.g., fin, baffle, etc.)
- DIG 410 .....Movable internal casing connecting to transverse element
- DIG 411 ....Connecting to shell by specific structure
- DIG 412 ....Including transverse element (e.g., fin, baffle, etc.)
- DIG 413 ....For directing flow along the length of tube
- DIG 414 ....For supporting coil tubes
- DIG 415 ....Including perforations
- DIG 416 ...Extending transverse of shell (e.g., fin, baffle, etc.)
- DIG 417 ....Including spacer or support for transverse tube support or shell-side flow director
- DIG 418 .....Tubular spacer sleeve
- DIG 419 .....Spacer or support connected to shell
- DIG 420 ....Segmented plate
- DIG 421 ....Disc and donut plates
- DIG 422 ....Unitary tube support or shell-side flow director carried by single tube
- DIG 423 ....Bar
- DIG 424 .....Forming grid structure
- DIG 425 .....Having ends connected to ring element
- DIG 426 ....Clamped tube spacer or support
- DIG 427 ...Manifold for tube-side fluid (i.e., parallel)
- DIG 428 ...Including flow director in manifold
- DIG 429 ...Line-connected conduit assemblies
- DIG 430 ...Manifolds connected in parallel (e.g., Multi-stage, etc.)
- DIG 431 ...Manifolds connected in series
- DIG 432 ...Including a tube sheet
- DIG 433 ....Tubes-tubesheet connection
- DIG 434 .....Plural strips forming tubesheet
- DIG 435 ...Plural bonded conduit end portions (i.e., tubesheet not needed)
- DIG 436 ...Bent conduit assemblies
- DIG 437 ....Coiled
- DIG 438 .....Helical
- DIG 439 ...Serially connected conduit assemblies (i.e., no manifold)
- DIG 440 ...Coiled conduit assemblies
- DIG 441 ...Helical
- DIG 442 ...Conduits
- DIG 443 ...Adjacent conduits with transverse air passages (e.g., radiator core type, etc.)
- DIG 444 ...Including transversely stacked fin sheets
- DIG 445 ...Including transverse corrugated fin sheets
- DIG 446 ...Including intermediate sheet between adjacent tubes forming air fin passages
- DIG 447 ....Corrugated sheet

- DIG 448 ..Air conduits (e.g., radiator core type, etc.)
- DIG 449 ..Vertically stacked conduits
- DIG 450 ...Including integral abutting or interlocking elements
- DIG 451 ..Including bent conduits
- DIG 452 ..Including fins
- DIG 453 ..Plural elements arranged to form a fluid passage
- DIG 454 **HAVING SIDE-BY-SIDE CONDUITS STRUCTURE OR CONDUIT SECTION**
- DIG 455 ..Readily detachable tubes having ends with distinct fluid coupling members engaging corresponding coupling members on manifold
- DIG 456 ..Readily and independently detachable sections
- DIG 457 ..Individual manifolds for each section
- DIG 458 ..Self-contained sections hydraulically connected in series
- DIG 459 ..Strips with shaped, interfitted edges form heat exchanger core with plural passages
- DIG 460 ..With spacers interposed between adjacent passages
- DIG 461 ..Plate fins formed with tubular projections which join with projections of adjacent plates to form parallel conduits
- DIG 462 ..Tapering, nested projections
- DIG 463 ...Conduits oblong in cross section
- DIG 464 ..Conduits formed by joined pairs of matched plates
- DIG 465 ..Manifold space formed in end portions of plates
- DIG 466 ...Manifold spaces provided at one end only
- DIG 467 ..With turbulence enhancing pattern embossed on joined plates
- DIG 468 ..Core formed by stack tubular members with abutting edges
- DIG 469 ..Reinforcing rod or strip extends across parallel fin edges
- DIG 470 ..Tensioning member within manifold
- DIG 471 ..Plural parallel conduits joined by manifold
- DIG 472 ..U-shaped conduits connected to side-by-side manifolds
- DIG 473 ..With clamping member at joint between header plate and header tank
- DIG 474 ...With compressible seal at joint
- DIG 475 ...Header plate and tank of dissimilar materials
- DIG 476 ..Fusion joint (e.g., solder, braze) between tube plate and header tank
- DIG 477 ..Elastic seal element between conduit ends and receiving holes in header plate
- DIG 478 ..Separate means employed for mechanical attachment and hydraulic seal of conduit ends to header plate
- DIG 479 ..Tubes joined to tube plate with adhesive (e.g., glue or braze compound)
- DIG 480 ..Elongated support members extending between spaced manifolds
- DIG 481 ..Partitions in manifold define serial flow pattern for conduits/conduit groups
- DIG 482 ...Partitions are separate members
- DIG 483 ..Flow deflecting/retarding means in header for even distribution of fluid to plural tubes
- DIG 484 ...Orifices mounted at conduit ends
- DIG 485 ..Unitary ("one-piece") header structure
- DIG 486 ..Corrugated fins disposed between adjacent conduits
- DIG 487 ...Louvered
- DIG 488 ..Header is rounded in cross section (e.g., circular, oval)
- DIG 489 ..Two piece header structure
- DIG 490 ..Noncircular tube cross section (oval, triangular, etc.)
- DIG 491 ..Manifolds formed in core-enclosing frame
- DIG 492 ..Plural conduits with ends connected to tube plate
- DIG 493 ..Welded or fused joint between conduit end and plate
- DIG 494 ..Conduit end deformed (e.g., expanded) to affix to plate
- DIG 495 ..Single unitary conduit structure bent to form flow path with side-by-side sections

- DIG 496 ..Spiral or helical coil  
DIG 497 ..Serpentine flow path with  
    straight side-by-side sections  
DIG 498 ...Fin assembly extends across  
    side-by-side sections  
DIG 499 .With parallel tubes or tube  
    sections having ends joined to  
    opposed frame members  
DIG 500 .Side-by-side conduits with fins  
DIG 501 ..Plate fins penetrated by plural  
    conduits  
DIG 502 ...Lanced  
DIG 503 ....Angled louvers  
DIG 504 ...Contoured fin surface  
DIG 505 ..Corrugated strips disposed  
    between adjacent conduits  
DIG 506 .Side-by-side conduits with means  
    (e.g., support grid) holding  
    them in spaced relation  
DIG 507 .Straight side-by-side conduits  
    joined for flow of one fluid  
DIG 508 ..Side-by-side conduits penetrate  
    parallel plate-type fins  
DIG 509 ..Side-by-side conduits lie in  
    common plane  
DIG 510 **HAVING HEAT EXCHANGE SURFACE  
TREATMENT, ADJUNCT OR  
ENHANCEMENT**  
DIG 511 .Polished heat transfer surface  
DIG 512 .Coated heat transfer surface  
DIG 513 ..Corrosion resistant  
DIG 514 ..Hydrophilic/hydrophobic coating  
DIG 515 .Patterned surface (e.g.,  
    knurled, grooved)  
DIG 516 ..Subsurface pockets formed  
DIG 517 .Roughened surface  
DIG 518 .Conduit with discrete fin  
    structure  
DIG 519 ..porous or mesh  
DIG 520 ..Internal and external  
DIG 521 ...Pin fins penetrating conduit  
    wall  
DIG 522 ..Transverse fins spaced along  
    conduit  
DIG 523 ...Separated by integral flanges  
    engaging conduit exterior  
DIG 524 ..Longitudinally extending  
DIG 525 ...Helical  
DIG 526 ....Spine or loop fins  
DIG 527 ...Integrally formed  
DIG 528 ..Fin and conduit of diverse  
    materials  
DIG 529 .With structure for promoting  
    turbulence and/or breaking up  
    laminar flow adjacent heat  
    transfer surface  
DIG 530 ..Conduit insert  
DIG 531 .With wicking structure  
DIG 532 **HEAT EXCHANGE CONDUIT STRUCTURE**  
DIG 533 .Composite of diverse materials  
DIG 534 ..Concentric layers  
DIG 535 .Helically formed  
DIG 536 .Noncircular cross-section  
DIG 537 ..Oblong or elliptical  
DIG 538 .With particular flow connecting  
    structure  
DIG 539 **HAVING A HEAT STORAGE MASS**





CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING, 422 - 1  
PRESERVING, OR STERILIZING

1	<b>PROCESS DISINFECTING, PRESERVING, DEODORIZING, OR STERILIZING</b>	27	..And additional disinfecting or sterilizing agent
2	..Step of warning or decreasing hazard of process	28	..Using disinfecting or sterilizing substance
3	..Process control in response to analysis	29	..In situ generation of agent other than aldehyde or glycol
4	..A gas is substance acted upon	30	..And removing the agent by chemical reaction or sorption
5	..Deodorizing	31	..And recovering or reusing the agent
6	..Affecting structure, article, etc., submerged in marine environment	32	..Treating bulk material
7	..Maintaining environment nondestructive to metal	33	..With positive pressure or vacuum
8	..Using protective article (e.g., antitarnish fabric, etc.)	34	..Using alkylene oxide
9	..Using gaseous preservative, preservative added to gaseous phase of environment, or maintaining gaseous phase nondestructive	35	..Using cyanide
10	...Manipulating gaseous environment for preservative purpose	36	..Using aldehyde
11	...Steam environment	37	..Using halogen or halogen- containing compound
12	..Aqueous acid environment (i.e., pH << 4.1)	38	..Using fluent heat transfer medium other than air
13	..Aqueous alkali environment (i.e., pH >> 8.4)	39	..By sudden release of pressure
14	..Essentially pure water environment	40	..Process of storage or protection
15	...Using organic compound having phosphorus	41	..Of liquid
16	...Using organic nitrogen compound other than ammonium salt	42	...By preventing evaporation
17	...Using organic carboxylic acid or salt thereof	43	...Of water
18	...Using inorganic silicon or phosphorus compound	44	<b>BLOOD TREATING DEVICE FOR TRANSFUSIBLE BLOOD</b>
19	...Using heavy metal or compound thereof	45	..Oxygenator
20	..Using sonic or ultrasonic energy	46	..Including integral heat- exchange means
21	..Using microwave energy	47	..Bubble or foam producing
22	..Using direct contact with electrical or electromagnetic radiation	48	..Membrane
23	..In atmosphere other than air	49	<b>INCLUDING MEANS FACILITATING PART REPLACEMENT OR REPAIR OTHER THAN SOLID, EXTENDED SURFACE, FLUID CONTACT MEANS</b>
24	..Ultraviolet	50	<b>ANALYZER, STRUCTURED INDICATOR, OR MANIPULATIVE LABORATORY DEVICE</b>
25	..Including additional step of preventing damage to sealed container	51	..Calorimeter
26	..Using direct contact steam to disinfect or sterilize	52	..Chemiluminescent
		53	..Corrosion tester
		54	..Flame ionization detector
		55	..Structured visual or optical indicator, per se
		56	..Having reagent in absorbent or bibulous substrate
		57	..Having coated reagent
		58	..In holder or container having special form
		59	...Column
		60	...Having plural-layered material

# CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING, PRESERVING, OR STERILIZING

61	.Test package or kit	83	.Means for analyzing gas sample
62	.Automatic analytical monitor and control of industrial process	84	..Breath tester
63	.Sample mechanical transport means in or for automated analytical system	85	...Based on color change
64	..Means is turntable (circular)	86	..Including means reacting gas with color indicator
65	..Means is conveyor and rack	87	...Strip indicator
66	..Means is moving tape or band	88	..Including means for adsorbing or absorbing gas into or onto liquid or solid media
67	..With specific analytical program control means	89	...Gas chromatography
68.1	.Means for analyzing liquid or solid sample	90	...With conductimetric detector
69	..Sorption testing	91	...With photometric detector
70	...Liquid chromatography	92	...With volumetric detector
71	...With radioactive material	93	..Including means dividing sample stream into plural parallel segments having diverse treating means and the analytical result compared or combined
72	..Including centrifuge	94	..Combustible gas detector
73	..With coagulometer for agglutination, clotting, or prothrombin, or for particle (e.g., cell, etc.) counting, or volume or characteristics determination	95	...With thermoelectric detector
74	..Dairy tester	96	...Wheatstone bridge
75	..Including titrator	97	....With specific coating on bridge element
76	...Conductimetric type	98	..Analysis based on electrical measurement
77	....With integrating or differentiating means	99	.Miscellaneous laboratory apparatus and elements, per se
78	..Including means for pyrolysis, combustion, or oxidation	100	..Pipette or other volumetric fluid transfer means
79	...Biological, chemical, or total oxygen demand (i.e., BOD, COD, TOD)	101	..Including means for separating a constituent; e.g., filter, condenser, extractor, etc.
80	...And means directly analyzing evolved gas	102	..Container
81	..Automated system with sample fluid pressure transport means	103	..Valve or connector structure
82	...And means segmenting fluid material	104	..Holder, support, housing, or hood
82.01	..Measuring electrical property	105	<b>CONTROL ELEMENT RESPONSIVE TO A SENSED OPERATING CONDITION</b>
82.02	...Resistance or conductivity	106	.Responsive to liquid level
82.03	...Ion selective electrode	107	.Control element directly mechanically linked to separate sensor
82.04	....Dissolved gas	108	.Control element responds proportionally to a variable signal from a sensor
82.05	..Measuring optical property by using ultraviolet, infrared, or visible light	109	..Controls heat transfer
82.06	...Optode or optrode	110	..Controls flow rate of a material to or from a contact zone
82.07	....Fluorescence	111	...Material is an input to contact zone
82.08	...Fluorescence	112	.Control element is fluid pressure sensitive
82.09	...Absorbance or transmittance		
82.11	...Waveguides		
82.12	..Measuring temperature		
82.13	..Measuring pressure		

CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING, 422 - 3  
PRESERVING, OR STERILIZING

113	..Pressure-relief valve (e.g., pop-off valve) or check valve	139	.Fluidized bed
114	.Control element is a binary responsive valve	140	..With liquid present
115	..Valve diverts flow from a contact zone	141	..Plural reaction beds
116	.Sensed condition is operating time and control is operation sequencer	142	...Sequentially arranged
117	<b>WITH SAFETY FEATURE</b>	143	..Including specific wind box or particulate matter support grid
118	.Preventing opening of closure of pressurized apparatus at unsafe pressure	144	..Including means to strip reaction mass from, or to regenerate, the particulate matter (including fluidized bed regenerators, per se)
119	<b>WITH INDICATING, SIGNALLING, RECORDING, SAMPLING, OR INSPECTION MEANS</b>	145	..And means providing flow of particulate matter into or out of reaction chamber
120	<b>FOR DEODORIZING OF, OR CHEMICAL PURIFICATION OF, OR GENERATION OF, LIFE-SUSTAINING ENVIRONMENTAL GAS</b>	146	..With heat exchange means affecting reaction chamber or reactants located therein
121	.With means exposing gas to electromagnetic wave energy or corpuscular radiation	147	..And means mechanically separating and removing particulate bed material from fluid effluent
122	.Including solid, extended surface, fluid contact reaction means (e.g., Raschig rings, particulate or monolithic catalyst, etc.)	148	.Ammonia synthesizer
123	.Including means adding material into environmental gas	149	.With means simultaneously carrying out conjugated reactions within single reactor
124	..And mechanical means creating forced draft at addition site	150	.Pigment or carbon black producer
125	..With material-heating means	151	..With means injecting quench stream into reaction chamber downstream of reaction site
126	...Material is combusted	152	..With particulate product collecting surface and means mechanically removing product therefrom
127	<b>SHOCK OR SOUND WAVE</b>	153	...Moving collecting surface
128	.Including supersonic or ultrasonic energy generation means	154	....Rotary collecting surface
129	<b>CHEMICAL REACTOR</b>	155	....Disk or plate
129.1	.Soap making	156	..With plural sequential reaction zones or chambers
130	.Bench scale	157	...With movably or removably mounted plug means for converting reactor from (N) to (N+1) reaction stages
131	.Organic polymerization	158	..Vapor phase reaction type
132	..Closed loop	159	.For radioactive reactant or product
133	..Generating foamed plastic	160	.Inorganic sulfur acid or anhydride producing type
134	..Including plural sequential reaction stages	161	..Acid is final product
135	..Including reactant agitating means in reaction chamber	162	.Inorganic hydrator
136	...And means rotatably mounting reaction chamber	163	.Explosives synthesizer
137	...Horizontal reaction chamber with screw or worm agitator	164	.Solid reactant type (i.e., absence of fluid reactants)
138	..With heat exchanger for reaction chamber or reactants located therein		

CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING,  
PRESERVING, OR STERILIZING

165	..Including ignition means for reactant	184.1	.For chemically destroying or disintegrating solid waste, other than burning alone
166	...Electrically actuated		
167	..Including reactor cooling means surrounding reactor	185	.For chemical recovery of chemicals from waste paper making liquor
168	.Waste gas purifier		
169	..Including means providing sequential purification stages	186	.With means applying electromagnetic wave energy or corpuscular radiation to reactants for initiating or perfecting chemical reaction
170	...Plural chemical reaction stages		
171	....Solid, extended surface, fluid contact type	186.01	..Magnetic
172	....And means downstream of a stage for injecting a reactant into waste gas for interreaction in subsequent stage	186.02	...Object protection
		186.03	...With electrical discharge
173	..With heat exchanger for reaction chamber or reactants located therein	186.04	..Electrostatic field or electrical discharge
174	...Electrical type	186.05	...Treating surface of solid substrate
175	...Regenerative heat sink	186.06	....Surface is metal
176	..Including waste gas flow distributor upstream of reaction site and within reaction chamber modifying velocity profile of gas	186.07	...Ozonizers
		186.08	...With preparatory or product-treating means
177	..Including solid, extended surface, fluid contact reaction means; e.g., inert Raschig rings, particulate absorbent, particulate or monolithic catalyst, etc.	186.09	....With drying means
		186.1	....With filtering or particle removal means
178	...And contact regenerating means or means for cleaning an internal surface of the reaction chamber	186.11	....With cooling, compression, condensation, or liquefying means
		186.12	...With subsequent use means
179	...Fixed bed with resilient or differential thermal expansion compensating bed support means	186.13	...With electrode moving means
		186.14	...With fluent reactant flow control means
180	...Unitary (i.e., nonparticulate) contact bed (e.g., monolithic catalyst bed, etc.)	186.15	...With current control or special electrical supply means
		186.16	....With pulse generating means
181	...Fixed annularly shaped bed of contact material and means directing gas therethrough substantially perpendicular to longitudinal axis of bed	186.18	...Cylindrical electrode
		186.19	....With heating or cooling means
182	..Including means injecting combustion fuel into reaction chamber in direct contact with waste gas	186.2	....With heating or cooling means
		186.21	...Arc or spark discharge means
183	...And means mixing combustion fuel with waste gas upstream of reaction site	186.22	...With electrode or reaction space heating or cooling means
		186.23	...With preparatory or product-treating means
		186.24	....With nitrogen fixation means
		186.25	....With cooling or pressurizing means
		186.26	....With electrode moving means
		186.27	....With current control means
		186.28	...With current control means
		186.29	...With RF input means
		186.3	..With ultraviolet radiation generating means
		187	.Combined

CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING, 422 - 5  
PRESERVING, OR STERILIZING

188	.Including plural reaction stages	204	...Means associated with jacket providing combustion gas as heat-exchange medium
189	..And means providing discrete sequential reaction stages; e.g., train, etc.	205	...Including baffle or stirring means disposed within jacket or chamber, the baffle means within chamber connected directly to wall thereof
190	...Plural solid, extended surface, fluid contact reaction stages each containing; e.g., inert Raschig rings, particulate sorbent, particulate or monolithic catalyst, etc.	206	..Regenerative heat sink
191	....Superimposed reaction stages in single reaction chamber	207	..Means injecting internal quench stream into reaction stream downstream of reaction stage
192	....At least one reaction stage formed of fixed, annularly shaped bed of contact material and means directing reaction stream therethrough substantially perpendicular to longitudinal axis of bed	208	..Apparatus operates at positive pressure
193	...Reaction stages located within single reaction chamber	209	.Including means rotating reaction chamber during use
194	....And means downstream of a stage for internally injecting a reactant into a reaction stream for interreaction in a subsequent stage, or injecting an internal quench stream into reaction stream passing between stages	210	..And means wiping or scraping interior surface of reaction chamber
195	....Means within reaction chamber redistributing reaction stream as it passes between adjacent stages	211	.Including solid, extended surface, fluid contact reaction means; e.g., inert Raschig rings, particulate absorbent, particulate or monolithic catalyst, etc.
196	..Including plural parallel reaction stages with each stage in form of a reaction tube	212	..With means removing and recovering product from extended surface contact material
197	...Tubular stages in single reaction chamber	213	..Particulate contact material type and means providing flow of particulate material into or out of reaction chamber with reactants or products
198	.Including heat exchanger for reaction chamber or reactants located therein	214	...Transfer line type reaction chamber
199	..Electrical type	215	...And internal mixing means
200	..Indirect heat-exchange tube within reaction chamber with a nonreactant heat-exchange fluid passing therethrough	216	..Compact bed of particulate, fluid contact material and means providing gravity flow of material within bed
201	...Tube and shell type	217	..And means upstream of extended surface, fluid contact means removing particulate impurities from reactant stream
202	..Heat-exchange jacket surrounding reaction chamber	218	..Fixed annularly shaped bed of contact material and means directing reactant therethrough substantially perpendicular to longitudinal axis of bed
203	...Including fluid-transfer means connecting chamber to heat-exchange jacket		

CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING,  
PRESERVING, OR STERILIZING

219	..And means loading contact material into, or unloading contact material from, reactor or means providing internal contact material reservoir	237	..Movably mounted container-type separating means and means moving same
220	..And reactant flow distributor upstream of contact means and within reaction chamber modifying velocity profile of reactant flow	238	..Solid reactant containing perforated or porous container-type separating means
221	..Fixed contact bed type with resilient or differential thermal expansion compensating bed support means	239	.Reaction chamber includes at least one perforated, porous, or semipermeable wall and is adapted for holding solid reactant
222	..Unitary (i.e., nonparticulate) contact bed, (e.g., monolithic catalyst bed, etc.)	240	.Including specific material of construction
223	..With contact material regenerating means, per se, or combined with reactor	241	..Reactor liner
224	.Including internal mixing or stirring means	242	.Positive pressure type
225	..Mechanical type stirring means	243	<b>PHYSICAL TYPE APPARATUS</b>
226	...In positive pressure reactor	244	.Including serially disposed vaporizing heating means (sublimers) and solid material deposition means maintained at a temperature lower than said heating means (condenser)
227	...Including a draft tube for internal recirculation	245.1	.Crystallizer
228	...Including flow directing baffle attached directly to reaction chamber wall	250.1	..Crucible-free zone refiner
229	...Longitudinally extending spiral stirring means	251	..Including means separating and conveying crystals to a melting zone
230	..Thermosyphon or differential density mixing means; e.g., means internally recycling reaction mass via differential density pumping, etc.	252	..Hydraulic classifier with crystallizer
231	..Gas sparger type mixing means submerged in liquid reactant	253	..Including feed compartment for introducing nutrient
232	.Including solid reactant and means charging solids into, or discharging solids from, reaction chamber	254	..Movable crystallizer or scraping means
233	..Having both charge and discharge means along with means conveying solids therebetween located within reaction chamber	255	.Means separating or dissolving a material constituent
234	.Including external recycle loop	256	..Liquid-liquid contact means
235	..And means heating or cooling loop or reaction mass located therein	257	...Including pulsator, adjustable plates, or plural inlets; e.g., spraying, etc.
236	.Including means separating reaction chamber into plural reactant-containing compartments and means moving reactant therebetween	258	...Including rotating chamber or rotating member within chamber; e.g., mixer-settler, etc.
		259	...Having rotating member within chamber
		260	...Including heating and cooling means
		261	..Liquid-solid contact means
		262	...Sulfur extraction
		263	...Including monolithic nonporous body of solute
		264	...Including means restricting solvent contact to one end of body of solute

CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING, 422 - 7  
PRESERVING, OR STERILIZING

265	...Buoyant holder	293	..Fluid having simultaneous diverse function
266	...Manual or mountable holder; e.g., soap holder, etc.	294	..Including flexible or collapsible treating chamber
267	...Including means to remove solids from a filter	295	..Including pressure treating chamber (above ambient)
268	...Conveyor support for solid material during contact; e.g., bucket, etc.	296	...Fluid pressure maintains closure or seal
269	...Including rotating member	297	...And rack, support or handling means
270	....Member is container	298	...And vaporizer; e.g., boiler, etc.
271	....Including internal rotating member	299	....Constituting treating chamber
272	....Partitions divide container	300	..Including rack, support or handling means
273	...Member conveys material into and out of container; e.g., screw propeller, etc.	301	...Apparatus closure operates means immersing article or material in liquid chemical
274	...Including perforated member which is nonlinear or inclined with respect to the major axis of container	302	...For treating container or covers therefor
275	...Including parallel perforated members perpendicular to, or parallel to, major axis of container	303	....Container is inverted
276	...Side wall of holder perforated	304	....Including endless conveyor
277	...Perforations of holder form inlet for solvent	305	..Including gas generating means
278	...Including plural orifice inlet, or deflector adjacent inlet for solvent flow	306	..Including means for adding a material to a gas
279	...Having inlet submerged within body of a solid solute	307	..Heat treating vessel with heating means
280	...Solvent vapor condenser	308	..Including multiple stages
281	...Means recirculating solvent	309	..Including comminuting, kneading, or surface-wiping means interior or vessel
282	...Including bypass	310	<b>ELEMENTS OR ADJUNCTS</b>
283	...Including dip tube for inlet or outlet of fluid solvent	311	..Bed support means (e.g., support grid or plate for supporting particulate bed of contact material, etc.)
284	...Internal heater; e.g., steam coil, etc.	312	..Tube element containing extended surface contact reaction means (e.g., a tube internally coated or packed with a catalyst, etc.)
285	..And heating means		
286	...Including mechanical comminuting or conveying means		
287	....Within treating vessel		
288	...Including means removing vapor from treated material		
289	....And direct contact heating fluid means within separating or dissolving chamber vessel		
290	...And indirect contact heating fluid means in separating or dissolving chamber		
291	..Combined		
292	..Apparatus for treating solid article or material with fluid chemical		
			<b>CROSS-REFERENCE ART COLLECTIONS</b>
		900	<b>DECREASING POLLUTION OR ENVIRONMENTAL IMPACT</b>
		901	<b>POLYMER DISSOLVER</b>
		902	<b>SODIUM CHLORIDE AND POTASSIUM CHLORIDE DISSOLVER</b>
		903	<b>RADIOACTIVE MATERIAL APPARATUS</b>
		904	<b>NITROGEN FIXATION MEANS</b>
		905	<b>MISCELLANEOUS LIQUID STERILIZATION MEANS</b>

March 2002

**CLASS 422 CHEMICAL APPARATUS AND PROCESS DISINFECTING, DEODORIZING,  
PRESERVING, OR STERILIZING**

906	<b>PLASMA OR ION GENERATION MEANS</b>	935	<b>FLUID TRANSFERRING GLASSWARE</b>
907	<b>CORONA OR GLOW DISCHARGE MEANS</b>		<b>[B01L 3/00B]</b>
908	<b>CRUCIBLES [B01L 3/04]</b>	936	.Tubes; conduits [B01L 3/00B2]
909	<b>CRYSTALLIZING DISHES [B01L 3/06]</b>	937	.Joints; seals [B01L 3/00B4]
910	<b>FLASKS [B01L 3/08]</b>	938	.Stopcocks; valves [B01L 3/00B6]
911	<b>WASH BOTTLES [B01L 3/10]</b>	939	<b>CONTAINERS FOR THE PURPOSE OF</b>
912	<b>GAS JARS OR CYLINDERS [B01L 3/12]</b>		<b>RETAINING A MATERIAL TO BE</b>
913	<b>TEST TUBES [B01L 3/14]</b>		<b>ANALYZED [B01L 3/00C]</b>
914	.Specific test tube, per se [B01L 3/14B]	940	.Made of a rigid material [B01L 3/00C2]
915	..With identification means, e.g., coded [B01L 3/14B2]	941	..With identification means, e.g., coded [B01L 3/00C2B]
916	.Closing or opening means, e.g., corks, bungs [B01L 3/14C]	942	..For multiple samples, e.g., micro-titration plate [B01L 3/00C2D]
917	..With identification means, e.g., coded [B01L3/14C2]	943	...Specially adapted for heating or cooling samples [B01L 3/00C2D2]
918	.Specially adapted for centrifugation [B01L 3/14D]	944	.Made of a flexible material [B01L 3/00C4]
919	<b>BURETTES; PIPETTES [B01L 3/02]</b>	945	..With identification means, e.g., coded [B01L 3/00C4B]
920	.Burettes, i.e., for withdrawing and redistributing liquids through different conduits [B01L 3/02B]	946	.With fluid transport, e.g., multi-compartment structure [B01L 3/00C6]
921	..Plunger type [B01L 3/02B2]	947	..Using capillary action, including fluid transfer through absorbent matrix [B01L 3/00C6C]
922	.Pipettes, i.e., with only one conduit for withdrawing and redistributing liquids [B01L 3/02C]	948	..For multiple samples, e.g., multi-well filtration [B01L 3/00C6D]
923	..Plunger pump type [B01L 3/02C3]		
924	...Capillary pipettes, i.e., having a very small bore [B01L 3/02C3C]		
925	...Having mechanical strokelength setting means, e.g., movable stops [B01L 3/02C3D]		
926	...Details of motor drive means [B01L 3/02C3M]		
927	...Having several coaxial pistons [B01L 3/02C3P]		
928	...Repeating pipettes, i.e. for dispensing multiple doses from a single charge [B01L 3/02C3R]		
929	...Supports for pipettes [B01L 3/02C3S]		
930	.Drop counters or drop formers [B01L 3/02D]		
931	.Interchangeable or disposable dispensing tips [B01L 3/02E]		
932	..Cooperating with positive ejection means [B01L 3/02E2]		
933	..Means for supplying or disposing of tips, e.g., racks or cassettes [B01L 3/02E4]		
934	.Mounted within a receptacle [B01L 3/02F]		

**FOREIGN ART COLLECTIONS**

**FOR 000 CLASS-RELATED FOREIGN DOCUMENTS**